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MEASURING EFFICIENCY IN LOCAL GOVERNMENTS' PLANNING AND REGULATORY FUNCTION

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Public sector reform has now become an established dimension of policymaking in many developed countries, including Australia. Although the ongoing program of public sector reform is Australia has focused mainly on the Commonwealth government and some state governments, especially Victoria, it is now being applied to local government. Key aspects of this process have been administrative reforms (compulsory competitive tendering and contracting-out), structural reforms (local council consolidations), legislative reforms (fiscal transparency and accountability), and workplace reform (labour market deregulation).

Another part has been the collection of new ideas associated with what has come to be known as the 'New Public Management'. Central ingredients in this movement have been the notion of explicit standards and measures of performance in the public sector, the greater emphasis on outputs rather than inputs, the shift to greater competition in the public sector, an emphasis on private-sector styles of management practice (ie. 'letting managers manage'), and a stress on greater discipline and parsimony in resource use (Hood, 1991). Finally, there is a greater awareness on the behalf of the Commonwealth

government of the desirability of promoting efficiency through the system of intergovernmental financial assistance. In common with the other pressures for greater efficiency and effectiveness in local public service provision, this process can be used for accurate and meaningful measures of local government efficiency for the purposes of comparative performance assessment and process benchmarking.

This paper is centrally concerned with the evaluation of technical and scale efficiency in New South Wales local government using the nonparametric approach to efficiency measurement. We examine technical and scale efficiency for a single function of Australian local government: namely, planning and regulatory services. The paper itself is divided into four main parts. The first section outlines the nonparametric approach to efficiency measurement for local public services and provides the formulation of the model employed. The second section provides the specification of inputs and outputs for planning and regulatory services. The results obtained from this analysis are discussed in the third section. The paper ends with some brief concluding remarks.

The Nonparametric Approach to Efficiency Measurement

Economists have developed three main measures of efficiency. Firstly, technical or productive efficiency refers to the use of productive resources in the most technologically efficient manner. Put differently, technical efficiency implies the maximum possible output from a given set of inputs. In cost terms, this means that an organisation should produce a specified level of output in the cheapest possible manner, Secondly, allocative efficiency refers to the distribution of productive resources amongst alternative uses so as to produce the optimal mix of output. In other words, allocative efficiency is concerned with choosing between the different technically efficient combinations of outputs. Taken together, allocative efficiency and technical efficiency determine the degree of economic efficiency. Thus, if an agency uses its resources completely allocatively and technically efficiently, then it can be said to have achieved total economic efficiency. Alternatively, to the extent that either allocative or technical inefficiency is present, then the organisation will be operating at less than total economic efficiency. Thirdly, and in contrast to both allocative efficiency and technical efficiency, dynamic efficiency is a much less precise concept. In general, dynamic

efficiency refers to the economically efficient usage of scare resources through time and thus embraces allocative and technical efficiency in an intertemporal dimension.

The empirical measurement of economic efficiency centres on determining the extent of either allocative efficiency or technical efficiency or both in a given organisation or a given industry. Economists have employed production possibility frontiers, production functions and cost functions in their attempts to measure efficiency in actual organisations and industries. Production possibility frontiers map a locus of potentially technically efficient output combinations an organisation is capable of producing at any point in time. To the extent an organisation fails to achieve an output combination on its production possibility frontier, and falls beneath this frontier, it can be said to be technically inefficient. Similarly, to the extent to which it produces some combination of goods and services on its production frontier, but which do not coincide with the wants of its clients (usually expressed in terms of the prices they are willing to pay), it can be said to be allocatively inefficient. Production functions provide an analogous means of relating inputs to outputs in a production process by including input prices. Cost functions transform the quantitative physical information in production frontiers into monetary values. Cost functions can thus convey information about the allocative and technical efficiencies of organisations in pecuniary terms.

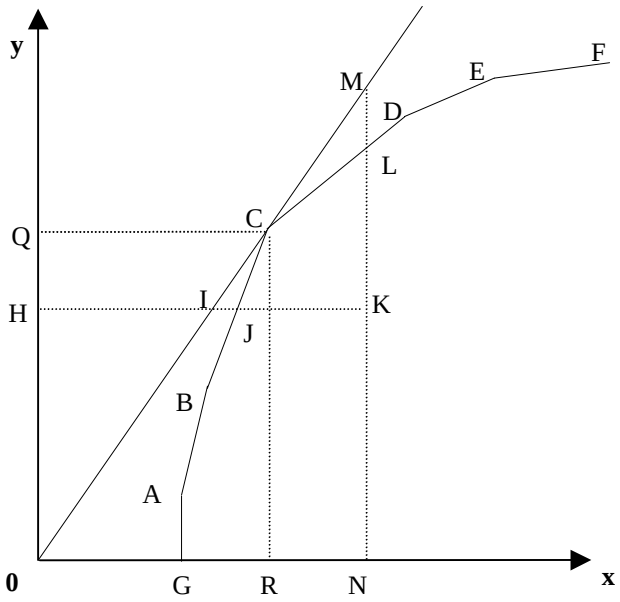
Accordingly, if we can determine production frontiers, production functions, or cost functions that represent total economic efficiency using the best currently known production techniques, then we can use this idealised yardstick to evaluate the economic performance of actual organisations and industries. By comparing the actual behaviour of organisations against the idealised benchmark of economic efficiency we can determine the degree of economic efficiency exhibited by some real-world agency. This general approach to efficiency measurement has been termed the ‘deterministic frontier approach’ (DFA). However, it may well be that deviation away from a given efficiency frontier may be due not to inefficiency by the organisation in question but rather external factors beyond its control. This has led to the development of the ‘stochastic frontier approach’ (SFA) which seeks to take these external factors into account when estimating the efficiency of given real-world organisation.

In contrast to both the DFA and SFA techniques, which attempt to determine the absolute economic efficiency of organisations against some given benchmark of efficiency, the ‘data envelopment analysis’ (DEA) approach seeks to evaluate the

efficiency of an organisation relative to other organisations in the same industry. DEA thus calculates the economic efficiency of a given organisation relative to the performance of other organisations producing the same good or service rather than against an idealised standard of performance.

The method used here to measure efficiency at the local level is based upon DEA, a mathematical programming approach to frontier estimation pioneered in Charnes, Cooper and Rhodes (1978) and extended in Banker, Charnes and Cooper (1984). There are several advantages of the DEA approach in evaluating the efficiency of government service providers. These include: its ability to handle the multiple inputs and outputs characteristic of public sector production, especially where it is difficult or impossible to assign prices to many of these factors; its capability of decomposing technical efficiency into scale effects and the effects of unwanted inputs which a service provider cannot dispose of; and its capacity to incorporate differences in operating environments beyond management control, particularly for the purposes of comparative performance assessment and process benchmarking (SCRSCCP, 1997). Measuring efficiency in this manner is consistent with both the literature associated with the efficiency analysis of government service providers in general, such as Ganley and Cubbin (1992), Kittelson and Forsund (1992) and Mensah and Li (1993), and with the majority of past empirical approaches to efficiency measurement in the local public sector, notably Charnes, Cooper and Li (1989), Cook, Roll and Kazakov (1990), Grosskopf and Yaisawarng (1990), Vanden Eeckaut, Tulkens and Jamar (1993), and De Borger and Kerstens (1996).

Figure 1. Technical and Scale Efficiency in Local Government



In parenthesis for technically inclined readers, Figure 1 illustrates the derivation of the efficiency measures found in DEA in the single-input (*x*), single-output (*y*) case. As shown, these envelopment surfaces may be either linear, as in the constant returns-to-scale (CRS) case, or convex as with variable returns-to-scale (VRS). The CRS and VRS cases are detailed: the CRS surface is the straight line 0*ICM* and the VRS surface is *GABCDEF*. For ease of exposition, the interior (or inefficient) councils are represented by point *K*. The efficiency of any interior point (such as *K*) is intuitively indicated by the distance between the envelope and itself. In the case of an input orientation, focus falls on maximal movement toward the frontier through the proportional reduction of inputs. For example, using an input orientation and the council depicted by point *K*, the measure of technical efficiency will be given by *hi/hk* in the CRS case, and by *hj/hk* in the VRS case. A measure of scale efficiency is provided by the ratio *hi/hj*. Using an output orientation, the technical efficiency of point K would be given as *nk/nm* in the CRS case, *nk/nl* in the VRS case, and the scale efficiency would be provided by *nl/nm*. Finally, for a council on the envelope surface, as denoted by *C*, the technical efficiency ratio would be *qc/qc* for technical efficiency under both VRS and CRS with an input orientation (a value of unity), and the scale efficiency measure in this case would also be *qc/qc*.

The specific extension of DEA to the multiple-input, multiple-output case was first introduced by Charnes *et al*. (1978) and extended in Seiford and Thrall (1990).

Consider N local councils each producing M different outputs using K different inputs. The relative efficiency of each council in ratio form is specified as follows:

$$\begin{aligned} &\max_{u,v}(u'y_i/v'x_i) \\ &\text{s.t. } u'y_j/v'x_j \le 1 \\ &\qquad u,v \ge 0 \end{aligned} \tag{1}$$

where y_i is the vector of outputs produced by the ith council, x_i is the vector of inputs used by the ith council, u is a $M\times1$ vector of output weights, v is a $K\times1$ vector of input weights, i runs from 1 to N, and j equals 1, 2, ..., N. The first inequality ensures that the efficiency ratios for all councils cannot exceed one, whilst the second ensures that the weights are positive. The weights are determined such that each council maximises its own efficiency ratio. This fractional linear program (1) can then be transformed into the following equivalent linear programming (LP) problem:

$$\begin{aligned} &\max_{\mu,v}(\mu'y_i) \\ &\text{s.t. } v'x_i = 1 \\ &\mu'y_j - v'x_j \le 0 \\ &\qquad \mu,v \le 0 \end{aligned} \tag{2}$$

where the notation change from u and v to μ and ν reflects the transformation. Using the duality of linear programming, this multiplier form can then be used to derive an equivalent envelopment form of the problem:

$$\begin{aligned} &\min_{\lambda,s^+,s^-} -(M1's^+ + K1's^-) \\ &\text{s.t. } -y_i + Y\lambda - s^+ = 0 \\ &\qquad \theta X - X\lambda - s^- = 0 \\ &\qquad\qquad \lambda,s^+,s^- \ge 0 \end{aligned} \tag{3}$$

where θ is a scalar, λ is a Nx1 vector of constants, s^+ is an $M\times1$ vector of output slacks, s^- is a $K\times1$ vector of input slacks, and $M1$ and $K1$ are $M\times1$ and $K\times1$ vectors of one, respectively. The value of θ will be the efficiency score for a particular council. It will satisfy $\theta \le 1$, with a value of 1 indicating a point on the frontier, and hence a technically efficient council. The nonzero slacks and the value of $\theta \le 1$ identify the sources and amount of any inefficiencies that may be present. There are at least three assumptions underlying this formulation that require further elaboration.

Firstly, these programs provide the input-orientated constant returns to scale envelopment surface, and a measure of overall technical efficiency (T_s). That is, emphasis is placed on the equiproportionate reduction of local government inputs. An input orientation is adopted since it is assumed that local governments take outputs as exogenous and have a larger degree of control over the level of inputs, especially within functional areas. In particular, one would expect that for a local government in Australia, the imposition of rate capping and other constraints on revenue raising would tend to restrict the amount of output possible in any one time period. Hence, a suitable behavioural objective for these institutions would be that of input minimisation, rather than output maximisation. The input measures thus provided can then detect failures to minimise inputs resulting from discretionary power and incomplete monitoring, and thereby provide an indication of possible gains from exploiting technical and scale efficiencies (De Borger and Kerstens, 1996, p. 11). For example, Ganley and Cubbin (1992) used an input-orientation to study the efficiency of U.K. local education authorities (LEAs). They argued *inter alia* that the initial emphasis in government policy is usually on the input dimension, since inputs are more amenable to scrutiny whereas outputs are often disputed (Ganley and Cubbin, 1992, p. 45). Other local public sector studies which employed an input-orientated approach include Pestieau and Tulkens' (1990; 1993), Rouse, Putterill and Ryan's (1995), and Ruggiero's (1996) respective studies of Belgian, New Zealand and New York State local authorities.

Secondly, the measure of technical efficiency detailed in (3) also assumes that any scaled-up or scaled-down versions of the input combinations are also included in the production possibility set. Overall technical efficiency can then be further divided into pure technical (PT_s) and scale efficiency (S_s), following Banker *et al*. (1984). Adding the convexity constraint ($N1'\lambda=1$) to (3) allows for variable returns-to-scale and provides a measure of pure technical efficiency (PT_s), whilst dividing overall technical efficiency by pure technical efficiency yields a measure of scale efficiency ($S_s= T_s/PT_s$). One shortcoming of this measure of scale efficiency is that its value does not indicate whether the council is operating in an area of increasing or decreasing returns to scale. This may be determined by imposing non-increasing returns-to-scale in (3) by replacing the $N1'\lambda=1$ restraint with $N1'\lambda\leq 1$. The NIRS surface is represented by *0CDEFI* in Figure 1. If the technical efficiency score under an assumption of non-increasing returns-to-scale is equal to the score obtained under variable returns-to-scale then

decreasing returns to scale apply. If they are unequal (as for point *K* in Figure 1) then increasing returns-to-scale exist for that council.

Lastly, the model formulation detailed in (3) also implicitly assumes that all inputs and outputs are discretionary, i.e. controlled by the management of each council and varied at its discretion. However, in most circumstances there may exist exogenously fixed or non-discretionary inputs and/or outputs that are beyond managerial control [see, for example, Golany and Roll (1993)]. In the case of the input-orientated models we have discussed, it is not relevant to maximise the proportional decrease in the entire input vector: rather maximisations should only be determined with respect to the sub-vector that is composed of discretionary inputs. Examples in the Australian local public sector include the regulatory constraints imposed by state-based legislation, the geographic and demographic characteristics of a given local government area, and accounting standards. The specific formulation employed to incorporate non-discretionary variables in the input-oriented BCC model may be found in Charnes, *et al*. (1993) and Ali and Seiford (1993).

An important task that arises after the calculation of the DEA measures is to attribute variations in efficiency to specific characteristics of local councils and the environment in which they operate. Several linear regression models have been employed to examine these relationships. In the first approach a logistic regression of general form:

$$l_i^* = z_i'\beta + e_i \qquad (4)$$

is estimated, where $l_i = 1$ if the *i*th council is efficient on the basis of a DEA measure of pure technical, scale or overall technical efficiency ($\theta = 1$), and $l_i = 0$ is the *i*th firm is inefficient ($\theta < 1$). Past approaches that have employed nonparametric techniques to measure government service efficiency followed by parametric techniques to assign variation in efficiency include Bjurek, Kjulin and Gustafsson (1992), De Borger, Kerstens, Moesen and Vanneste (1994), De Borger and Kerstens (1996) and Athanassopoulos and Karkazis (1997).

The second regression approach seeks to explain the slack inefficiency in each council: that is, slack in the form of excessive utilisation of specific resources or underprovision of outputs. This analysis is likely to illuminate areas of particular concern to management, and has been employed by Fried *et al*. (1993; 1996) in the

analysis of efficiency in U.S. credit unions. This requires estimation of ordinary least squares (OLS) equations of the form:

$$s_i^{+,-} = z_i'\beta + e_i \qquad (5)$$

where s_i is the total slack (both radial and non-radial) in the output (+) or input (-), and all other variables are as previously defined.

Specification of Inputs and Outputs

The variables used to provide efficiency measures using the non-parametric methodology are outlined in Table 1. Following Smith and Mayston (1987), Deller *et al*. (1992) Valdmanis (1992), Kooreman (1993), Thanassoulis and Dunstan (1994), and Thanassoulis *et al*. (1996), a single function is employed to evaluate DEA as a tool of efficiency analysis in government service provision. The activity selected in the current study is the provision of planning and regulatory services by New South Wales (NSW) local governments. All data corresponds to the year ending 31 December 1993 (the first year in which statements were prepared under *AAS27 Financial Reporting by Local Government*) and is obtained from the NSW Department of Local Government (NSWDLG), the NSW Local Government Grants Commission (NSWLGGC) and the Australian Bureau of Statistics (ABS).

Table 1. Variables and Descriptive Statistics, Planning and Regulatory Services

Variable	Description	Mean	Std. dev.	Min.	Max.
Non-discretionary inputs					
x_1	Population growth rate	0.0084	0.0015	-0.0335	0.0466
x_2	Development index	11.7460	29.6300	3.9500	395.870
x_3	Heritage/environmental sensitivity	1.844	0.8616	1.0000	5.0000
x_4	Non-residential building activity	2.3768	2.4662	0.0000	30.5760
x_5	Population distribution	4.8172	6.8277	0.0000	50.4760
x_6	Non-English speaking background	0.0836	0.0933	0.0042	0.4378
Discretionary inputs					
x_7	Planning and regulatory expenditure	0.59E+06	0.88E+06	1000.00	0.41E+07
x_8	Legal expenditure	56015	0.11E+06	0.0000	0.68E+06
x_9	Full-time equivalent staff	8.3985	13.283	0	107
Discretionary outputs					
y_1	Number of BAs determined	748.49	985.02	0.0000	5083.00
y_2	Number of DAs determined	280.90	329.77	0.0000	1760.00
Australian Classification of Local Governments					
z_3	Urban, metropolitan developed (UCC, UDV, UDL, UDM, UDS)				32
z_2	Urban, regional town/city (URV, URL, URM, URS)				37
z_3	Urban, fringe (UFV, UFL, UFM, UFS)				11
z_4	Rural, significant growth (RSG)				5

z_5	Rural, agricultural (RAV, RAL, RAM, RAS)	85
z_6	Rural, remote (RTL, RTM, RTS, RTX)	3

The planning and regulatory services provided by NSW local governments may be broadly referred to as an 'economic' service. The issue of the local approvals process has been under review in NSW for some time, "with the aim of improving consistency in decision-making, efficiency, and planning outcomes" (IPART, 1997, p. 94). For example, two group studies have recently developed frameworks for benchmarking planning and regulatory processes. One was undertaken by the Shore Regional Organisation of Councils (SHOROC), and the other by the Western Sydney Regional Organisations of Councils (WSROC). Both of these projects were funded by the Federal Government's Local Government Development Program (LGDP) and applied to two groups of four councils each. By contrast, the data set analysed in the current study applies to the entire sample of 173 local governments.

The set of nondiscretionary contextual factors which are likely to impact upon measured efficiency are included in Table 1. These are: average population growth over the previous five years (x_1); a regression-based index of development activity (x_2); the NSWLGGC's subjective assessment of the areas subject to heritage/environment sensitivity (x_3); the proportion of properties classified as 'commercial or industrial' (x_4); a disability factor indicating the proportion of the population from a NESB (x_5), and population distribution (x_6). All other things being equal, these factors indicate the needs for higher inputs imposed upon a council's planning and regulatory function by additional costs in development control (development activity), forward planning (population growth), the provision of supplementary information (NESB), the duplication of services and staff travel (distribution), and additional complexities related to plan preparation and development control (heritage/environment). Some indication of the marginal impact of these factors on inputs can be discerned from the NSWLGGC's calculation of expenditure disabilities for building control and planning activity, with the three highest weightings in standard costs calculations being given to building and development activity, the proportion of non-residential properties, and the proportion of the population from a NESB.

Three discretionary inputs and two discretionary outputs are specified in the model of local government's planning and regulatory function. The inputs are: (i) planning and regulatory expenditures (x_7); (ii) legal expenditures related to the planning and

regulatory function (as an indicator of the level of disputation in the planning process) (x_8); and (iii) the number of full-time equivalent staff employed in the planning and regulatory function (x_9). A relatively efficient council *ceteris paribus* will therefore minimise the costs associated with planning and regulation, the amount of staff employed, and the level of legal disputation involved, all within the confines of the factors not subject to managerial discretion. The incorporation of the 'legal cost' input is particularly important since the majority of councils' legal costs are concerned with planning and regulatory activities [where the balance is largely associated with costs arising from conveyancing, resumptions, leases and general legal advice] (NSWDLG, 1998, p. 32). The outputs employed are twofold. The first of these is the number of building applications (BAs) determined and approved (y_1); and the second is the number of development applications (DAs) likewise determined and approved (y_2). As a general rule, most planning and regulatory expenditures involve DAs, with other costs split between enforcement and building matters (NSWDLG, 1998). Once again, the efficiency of providing the planning and regulatory function will only be measured in regard to the discretionary decisions taken by a council, not to the characteristics of the LGA for which the council has responsibility. It may also be useful to reiterate the fact that the focus of the present study is on the *efficiency* of service provision, and bears no regard for *effectiveness*, encompassing as it does matters of outcomes, quality, appropriateness or accessibility.

These issues are highlighted with reference to the recent SHOROC and WSROC benchmarking projects (NSWDLG, 1997). Both of these projects specified that the performance of the local approvals process consists of four key aspects. These were: (i) the number of applications processed and processing times, (ii) the overall cost of the planning and regulatory process; (iii) customer satisfaction with the local planning and building approvals process; and (iv) adequate planning outcomes (IPART, 1997, p. 98). The focus of the current analysis is only on the first two aspects, relating as they do to the 'efficiency' of the planning and regulatory function. The focus of the second and third aspects, assessing whether approvals outcomes are consistent with area plans and using community surveys to measure satisfaction with the level of community involvement with the outcome of development approvals, is clearly associated with ideas of 'appropriateness' and 'quality', or the 'effectiveness' dimension of performance.

The final set of variables ($z_1 - z_6$) detailed in Table 1 relate to the Australian Classification of Local Government (ACLG) categories, which are in turn based upon objective geographic/demographic criteria. It is argued that other considerations may still have an influence on a council's efforts to attain an efficient outcome, even after the vector of non-discretionary inputs is taken into account. For example, in the case of planning and regulatory services, large councils may have a secondary CBD or other commercial concentrations which serve to complicate the planning and regulatory function. If the vector of dummy variables in either of these cases proves to be an insignificant influence on efficient outcomes, then local governments across New South Wales should be able to be compared solely on the basis of the input/output vector and individual disability factors. Alternatively, evidence of a systematic relationship between one or more ACLG categories may focus the search for excluded disability factors, or analysis of managerial conditions unique to that local government classification.

Empirical Results

The results of the analysis of technical and scale efficiency using local governments' planning and regulatory function is presented in Table 2. The non-discretionary inputs posited to exert an influence on performance include the level of building activity, the degree of environmental or heritage sensitivity, and the proportion of the population from a non-English speaking background. The discretionary input are planning and regulatory expenditure, legal expenditure relating to the planning function, and the number of full-time equivalent staff. Outputs are denominated in either the number the building applications determined, and the number of development applications, likewise approved. Descriptive statistics are also detailed in Table 3

Table 2. Planning and Regulatory Services Efficiency Indices

	Technical efficiency		Pure technical efficiency		Scale efficiency	
	All councils	*Inefficient councils*	*All councils*	*Inefficient councils*	*All councils*	*Inefficient councils*
Number	173	80	173	62	173	76
Mean	0.7947	0.5559	0.8384	0.5490	0.9413	0.8665
Standard deviation	0.2728	0.2338	0.2551	0.2255	0.1268	0.1635
Lowest quartile	0.5858	0.3745	0.6536	0.3832	0.9579	0.7926
Next to lowest quartile	1.0000	0.5566	1.0000	0.5578	1.0000	0.9460
Next to highest quartile	1.0000	0.7292	1.0000	0.6787	1.0000	0.9832

Highest quartile	1.0000	0.9700	1.0000	0.9974	1.0000	0.9998

For the average council, the equiproportionate reduction of inputs to 83.8 percent of their current level would entail pure technical efficiency, while the average productivity loss due to scale inefficiency is 5.87 percent. The distribution of inefficiency indicates that 62 (or 36 percent) of councils are pure technically efficient in the provision of planning and regulatory services, whereas 75 percent of councils have an efficiency score greater than 65.36 percent. For scale efficiency, 44 percent of councils are scale efficient, and 75 percent of councils have an efficiency score greater than 95.8 percent.

Table 3. Summary of Statistical Test Results, Planning and Regulatory Services

Test procedure	Hypothesis	Group A	Group B	Pure technical	Scale efficiency
Welch	H_0: $\sigma^2_A = \sigma^2_B$ H_1: $\sigma^2_A \neq \sigma^2_B$	UD	All	1.359	0.2667
	$T_W \sim N(0, \sigma^2)$	UR	All	0.2861	0.9359
		UF	All	2.5303**	2.0775**
		RSG	All	-0.5273	0.5901
		RA	All	-1.0724	-1.1590
Mann-Whitney	H_0: $\sigma^2_A = \sigma^2_B$ H_1: $\sigma^2_A \neq \sigma^2_B$	UD	All	1.2006	1.2931
	$T_{MW} \sim N(0, \sigma^2)$	UR	All	3.1149***	3.1132***
		UF	All	0.0691	-0.5491
		RSG	All	1.0302	0.5512
		RA	All	4.4633***	4.2963***
Banker's asymptotic test (exponential)	H_0: $\sigma^2_A = \sigma^2_B$ H_1: $\sigma^2_A > \sigma^2_B$	RA	RSG	-17.2753***	-7.6201***
	$T_{EXP} \sim F(2N_A, 2N_B)$	RA	UR	13.8378***	46.1863***
		UF	UR	16.2766***	74.0335***
		UF	UD	0.1202	0.0061
		UR	UF	0.0614	0.0135
		UR	UD	1.9576***	0.4560
Banker's asymptotic test (half-normal)	H_0: $\sigma^2_A = \sigma^2_B$ H_1: $\sigma^2_A > \sigma^2_B$	RA	RSG	9.9449	2.6756
	$T_{EXP} \sim F(N_A, N_B)$	RA	UR	16.9744***	113.31***
		UF	UR	90.8395***	5344.86***
		UF	UD	0.0312	5.69E-05
		UR	UF	0.0110	0.0001
		UR	UD	2.8391***	0.3046

Notes: Asterisks represent significance at the * – .10, ** – .05 and *** – .01 level for t-tests; F-tests undertaken at .01 level only; UD – urban developed, UR – urban regional, UF – urban fringe, RSG – rural significant growth, RA – rural agricultural; "All" indicates other groups exclusive of Group A.

Banker's (1993) test for returns-to-scale [i.e. assuming the half-normal distribution of efficiency differences, such that T_{HN} = 2.26] rejects the null hypothesis of constant returns-to-scale, and we may conclude that the provision of planning and regulatory services in local government is subject to variable returns-to-scale. However, the test made on the basis of an exponential distribution fails to reject the null hypothesis [where T_{EXP} = 1.27]. Of the 173 councils, 25 (or 14.4 percent) exhibit decreasing

returns-to-scale, 51 (or 29.4 percent) are subject to increasing returns-to-scale, and the remainder are operating at the correct scale of operations. Those councils with decreasing returns-to-scale include Burwood, North Sydney and Botany in the urban developed category, Armidale, Byron Bay and Port Stephens in the urban regional category, Wollondilly in the urban fringe category, Nymboida and Maclean in the rural councils with significant growth, and Bellingen and Nambucca in the rural agricultural category.

Table 4. Planning and Regulatory Services Efficiency by ACLG Category

		Pure technical efficiency				Scale efficiency			
ACLG	*Total*	*Mean*	*Std. Dev*	*# Eff.*	*% Eff.*	*Mean*	*Std. Dev*	*# Eff.*	*% Eff.*
UCC	1	1.0000	0.0000	1	100	1.0000	0.0000	1	100
UDS	5	0.8879	0.1880	3	60	0.9833	0.0246	3	60
UDM	13	0.9299	0.1458	10	77	0.9406	0.1614	9	69
UDL	7	0.8808	0.1928	4	57	0.9544	0.0822	4	57
UDV	7	1.0000	0.0000	7	100	0.9658	0.0735	5	71
URS	15	0.8262	0.2667	10	67	0.9578	0.0966	8	53
URM	18	0.8549	0.2362	12	67	0.9937	0.0139	12	67
URL	1	1.0000	0.0000	1	100	1.0000	0.0000	1	100
URV	3	1.0000	0.0000	3	100	1.0000	0.0000	3	100
UFS	1	1.0000	0.0000	1	100	1.0000	0.0000	1	100
UFM	2	0.9523	0.0674	1	50	0.9985	0.0021	1	50
UFL	3	1.0000	0.0000	3	100	1.0000	0.0000	3	100
UFV	5	1.0000	0.0000	5	100	1.0000	0.0000	5	100
RSG	5	0.7071	0.3214	2	40	0.9834	0.0232	2	40
RAS	4	0.7806	0.4388	3	75	0.9893	0.0214	3	75
RAM	36	0.8170	0.2500	20	56	0.8883	0.1681	17	47
RAL	26	0.7647	0.2978	14	54	0.8903	0.1741	11	42
RAV	19	0.8058	0.2796	11	58	0.9631	0.0880	8	42
RTL	1	0.2655	0.0000			0.9655	0.0000		
State	173	0.8384	0.2551	111	64	0.9413	0.1268	97	56

The analysis of efficiency differences across ACLG categories (Table 4) and the hypothesis tests of efficiency differences between groups (Table 3) indicate that efficiency varies across the sample. The Welch tests of efficiency differences show that urban fringe councils have a different distribution of planning and regulatory efficiency than the remaining councils, whereas the Mann-Whitney test demonstrates this is the case for urban regional and rural agricultural councils. Banker's (1993) asymptotic tests indicate that, on average, rural agricultural councils are more technically efficient with regard to planning and regulation than rural councils with significant growth, although less so than urban regional governments. In turn, urban fringe councils are less efficient with regard to planning and regulation than their urban regional counterparts, which are in turn less efficient than urban developed councils. Scale efficiency measures suggest that both urban fringe and rural agricultural councils are less efficient on average than urban regional councils with regards to planning and regulation.

Table 6. Determinants of Planning and Regulatory Services Efficiency Variation

	Pure technical efficiency		Scale efficiency	
	Coefficient	*Std. error*	*Coefficient*	*Std. error*
UD	1.0986***	(0.4081)	0.6466*	(0.3721)
UF	2.3020**	(1.0325)	2.3024**	(2.2120)
UR	0.8602**	(0.3596)	0.6130*	(0.3443)
RSG	-0.4054	(0.9128)	-0.4054	(0.9128)
RA	0.2602	(0.2187)	-0.1651	(0.2176)

Notes: Asterisks represent significance at the * – .10, ** – .05 and *** – .01 level; UD – urban developed, UR – urban regional, UF – urban fringe, RSG – rural significant growth, RA – rural agricultural.

The regression-based analysis of efficiency differences in the provision of planning and regulatory services also suggests variation across the sample on the basis of geographic and demographic conditions. As indicated in Table 5, urban developed, urban fringe, and urban regional councils are, on average, significantly more technically efficient in the provision of planning and regulatory services. Examination of the coefficients when scale efficiency is regressed upon ACLG categories also shows that scale efficiency is higher for the three groups. An analysis of the elasticity (at the means) of the geographic/demographic dummy variables suggests that the marginal increase in pure technical efficiency is greatest for urban fringe councils (0.0655) and lowest for urban regional councils (0.0475). It appears that relatively 'new' urban councils have placed a greater focus on the efficient provision of planning and regulatory functions than councils with a longer tenure. However, marginal effects for scale efficiency are greatest for urban developed councils (0.0697), followed by urban regional (0.0631), and urban fringe councils (0.0502). The argument here is that these larger councils have been able to identify the optimum scale of planning operations, especially since the imposed factors which affect these services, such as development activity, have been more stable over time.

The final area of analysis relates to the regression of total slack in planning and regulatory services (assuming variable returns-to-scale) against the ACLG-based dummy variables. Estimated coefficients and elasticities (calculated at the means) for the three discretionary inputs and two outputs are listed in Table 7. As shown, the output slack is generally unrelated to geographic/demographic classification, while input slack is unevenly distributed across the sample. All other things being equal, expenditure slack (both radial and non-radial) is greatest for urban regional and urban

developed councils, followed by rural agricultural councils. On the other hand, legal slack is proportionately higher for urban developed and urban regional councils. It may well be that these councils have some difficulty in managing the level of disputation associated with planning and regulatory services.

Table 7. Determinants of Planning and Regulatory Services Total Slacks

	Expenditure *Coefficient*	Legal *Coefficient*	Staff *Coefficient*	BA *Coefficient*	DA *Coefficient*
UD	96.071***	19985**	0.8112	13.9350***	0.3743
	(0.27E+05)	(7575.0)	(0.5462)	(3.964)	(7.268)
UF	4669.4	791.45	0.0345	0.0000	0.0000
	(0.44E+05)	(0.12E+05)	(0.9316)	(3.6860)	(12.4000)
UR	0.11E+06***	16014**	2.3168***	0.0000	23.6390
	(0.24E+05)	(7045.0)	(0.5079)	(6.7610)	(6.7590)
RSG	63559	3141	2.4040*	0.0000	1.7140
	(0.6646)	(0.19E+05)	(1.3820)	(10.0300)	(18.3900)
RA	27253*	1295.8	0.6203*	0.6737	2.7640
	(0.16E+05)	(4648.0)	(0.3351)	(2.4320)	(4.4600)
	Expenditure *Elasticity*	Legal *Elasticity*	Staff *Elasticity*	BA *Elasticity*	DA *Elasticity*
UD	0.3073	0.4680	0.1449	0.8862	0.0105
UF	0.0051	0.0064	0.0021	0.0000	0.0000
UR	0.4217	0.4336	0.4785	0.0000	0.7645
RSG	0.0318	0.0115	0.0671	0.0000	0.0075
RA	0.2315	0.0806	0.2943	0.1138	0.2054

Notes: Asterisks represent significance at the * – .10, ** – .05 and *** – .01 level; figures in brackets are the corresponding standard errors; elasticities calculated at means; dependent variable in least squares regression is total slack (residual and non-residual) from variable returns-to-scale model; UD – urban developed, UR – urban regional, UF – urban fringe, RSG – rural significant growth, RA – rural agricultural.

Finally, staff slack is greater for urban regional councils, followed by rural agricultural and rural councils with significant growth. One pertinent consideration in this instance may be that very small councils may be forced to ‘scale-up’ planning functions simply to attain a feasible size. Put differently, town planing is a specialised professional activity and it may not be possible to provide this function with anything less than one full-time-equivalent staff member: even this minimal scale of operations may be too large for many smaller councils. Another possibility for the differences in scale efficiency is that many urban regional councils have secondary CBDs or relatively high commercial concentrations. It is likely that the vector of nondiscretionary inputs does not fully reflect the additional staff needed to cover a widely dispersed population.

Concluding Remarks

A number of conclusions emerge from the present study. Firstly, just as the geographic, demographic and socioeconomic characteristics of Australian councils vary widely, so too does the level of technical and scale efficiency across councils. All other things being equal, urban developed, fringe and regional councils are relatively more technically and scale efficient than rural councils in the provision of planning and regulatory services than rural, non-urban councils. This holds even when factors that may impact upon the efficiency of planning services, such as population dispersion, are taken into account.

Secondly, in terms of the function analysed, namely, planning and regulatory services, pure technical inefficiency contributed the most to technical inefficiency, with scale inefficiency being relatively less important. This would suggest that the inability to combine inputs and outputs in optimal proportions is the main cause of inefficiency in most council economic services, rather than the inability to attain an optimal scale of operations. Finally, the main source of efficiency in urban councils would appear to be excessively large legal expenses related to the planning process, whilst for rural councils the main source is excessively large planning staff numbers. One reason that this latter finding is the requirement to maintain a minimum feasible planning department, regardless of a council's planning requirements.

These conclusions have very different policy implications. For example, the failure to achieve an optimal scale of operations in the provision of planning services may be an argument supporting a greater degree of resource-sharing and regional co-operation in these services. Likewise, the fact that councils may be obliged to provide a minimum scale of planning operations has important implications for Australia's system of intergovernmental grants and the stated objective of 'horizontal equalisation' (whereby factors beyond a council's control are factored into relative grants). However, one of the main findings of this analysis is the significant amount of efficiency variation between councils that exists even when nondiscretionary factors are taken into account. That is, when variables postulated to affect the provision of local public sector functions are included in the mathematical constraints, and efficiency improvements are only measured against those variables over which a council exerts managerial control, efficiency differences remain. More particularly, these efficiency differences are often systemic to particular categories of local governments in New South Wales.

Two possibilities seem feasible. Firstly, the vectors of nondiscretionary variables included have some how inadvertently excluded some relevant factors. Alternatively, those variables which are included inappropriately proxy the disabilities imposed upon particular councils. The second possibility is that discretionary factors unique to individual councils are distributed in a non-random manner across the sample. For example, whereas councils may share geographic and demographic characteristics, they may also have other factors in common. These may include the political characteristics of elected representatives, the financial profile of the council, or the quality of managerial inputs. These additional considerations would provide useful starting points for future empirical studies.

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